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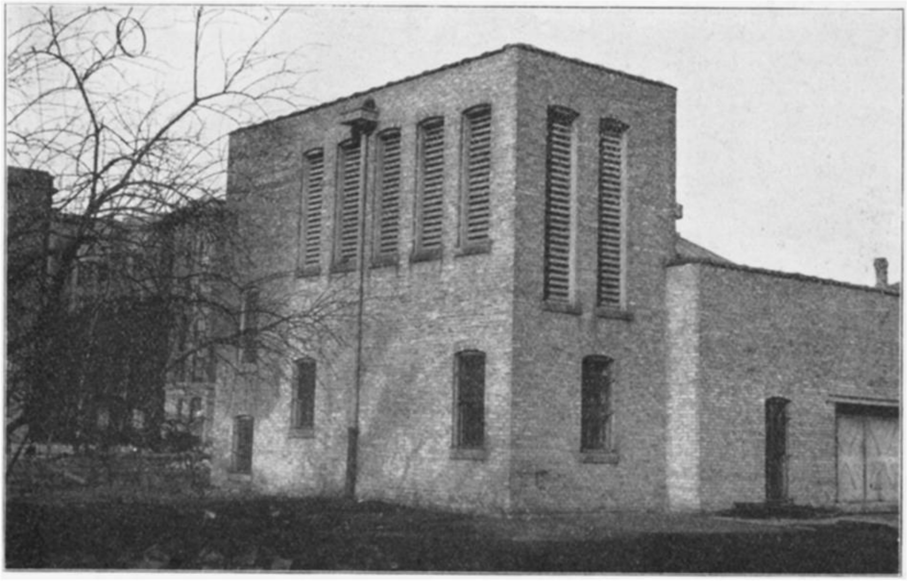
Pedagogic Course in Nature Study

Charles W. Carman



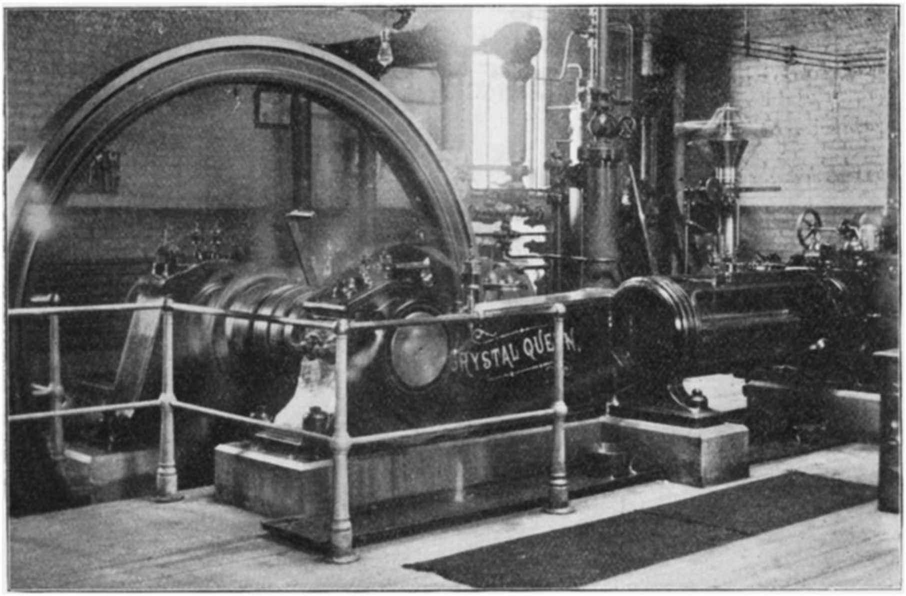
ARTIFICIAL REFRIGERATING PLANT

NOTE.—The outline for the spring quarter is adapted from Jackman's *Nature Study for Grammar Grades*.

The nature study work for April is divided into three general groups. The first group will include those observations that embrace the phenomena of mechanics most closely associated with the student's daily life. An effort will be made to trace the mechanics of nature during the transition of winter into spring. During the winter months enormous forces are lying dormant—hibernating, we may say—but as the spring opens these forces seem to vie with each other for first place in the new season. It is well to observe, as far as possible, how these transitions are accomplished. These forces operate silently and incessantly, and the student who learns the processes must be equally persistent in his observations and study.

The second group will include those observations that embrace the astronomical and meteorological phenomena most potent in the transition of winter into spring. An effort will be made to trace the functions of the sun, atmosphere, water, and soils in the great transformation that is taking place. We may study and wonder at the marvelous mechanics of ocean steamships, of railway transportations, and of manufacturing plants, but all are as the toys of children compared with the forces put forth in the industries of nature.

The third group will include those observations that embrace the biological, zoölogical, and botanical phenomena that appear in consequence of the advancing season.



ICE-MAKING MACHINE

References: FIRST GROUP. Jackman, *Nature Study for Grammar Grades*, Ch. XI, pp. 93-106, Ch. XIII, pp. 114-122, Ch. XVII, pp. 136-144; Ch. XXV, pp. 192-212.

I. Plan for work under first group.

1. Visit the boiler-room of the Chicago Institute and select a small piece of coal from the coal-bin. Take it to the chemical laboratory, break it in pieces not larger than a pea, place them in a six-inch, hard-glass test-tube, heat the tube until escaping gas will ignite at the mouth of the tube. Place the residue on a piece of platinum or porcelain, and heat in a Bunsen flame until the residue turns gray.

2. Visit the nearest gas-manufacturing plant. Observe the retorts, the coolers, the washers, the purifiers, and the reservoirs. Make notes and sketches preparatory to a report in the classroom. Note especially the "by-products" and determine the uses made of them.

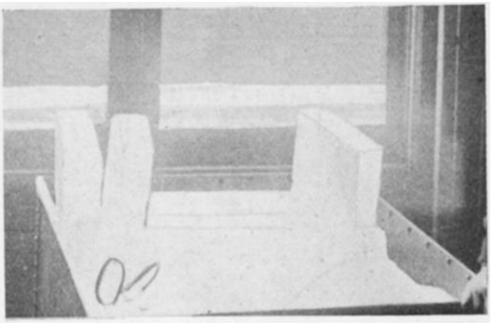
3. Visit an artificial ice-making and refrigerating plant. Observe the method of compressing the ammonia gas, the coolers, the "freezers," and the products. Make notes and sketches preparatory to a report in the classroom. Compare the artificial and natural forces employed in ice-formation. Return to the boiler-room and observe the fire-box under the boiler. Observe the structure of the boiler. Trace the flue to the chimney. Trace the steam-pipes from the boiler to the various radiators throughout the building. Trace the returns to the boiler-room. In like manner observe the fire-boxes, boilers, and steam-pipes in the basement of the Crilly block, just opposite the Institute building. Observe the reading of the steam-gauges, and compare with the reading of the steam-gauge on the Institute boiler. Trace the steam-pipes from the boiler to the engine, through the steam-chest to the cylinder and to the exhaust. Trace the connection of the piston to the shaft of the engine. Trace the connections of the engine shaft to the armature of the electro-dynamic machine used to furnish the building with electric current. Trace the parts of the electro-dynamic machine and the relation of the parts to each other. Notice carefully how they are functioned. Trace the wires from the machine to the switch-board. Sketch the board as a whole, and note the functions of the various switches, bus-bars, and instruments. More detailed study is expected on the return to the classroom and laboratory.

4. Visit the Edison electric light and power station located just north of the Newberry Library. Make the observations indicated above. Trace the wires from the station to the Chicago Institute building, and into the switchboard of the same. Trace and sketch all the wires leading from the switchboard to the

lamp-outlets in the basement. Dissect a lamp-socket and sketch all the parts. Dissect a "burned-out" lamp and sketch all its parts. Read the meter on the switchboard in the basement. (Note: A similar meter will be shown and dissected in the classroom.) Compute the current used when all the lamps, incandescent and arc, in the Institute are operating. Compute the diameters, weight, and cost of the copper wire necessary to conduct the current from the station to the lamps in the Institute. Compute the cost of the sockets and lamps from data furnished.

5. Locate the telephones connected with the Institute's intercommunicating system. Note the number of wires leading from each telephone, and the method of connecting to each. A similar telephone will be shown and dissected in the classroom. Sketch all the parts and trace the relations between the parts. Make a sketch showing the system used in the Institute. Detailed drawings and specifications will be furnished for the construction of a telephone transmitter and receiver. Make the constructions in the sloyd room and laboratory.

References: SECOND GROUP. Jackman, *Nature Study for Grammar Grades*, Ch. III, pp. 15-36, Ch. IV, pp. 37-44, Ch. X, pp. 91-92, Ch. XVI, 133-135, Ch. XXII, pp. 170-172, Ch. XXIX, pp. 239-246, Ch. XL, pp. 386-397, Ch. XLI, pp. 398-402.

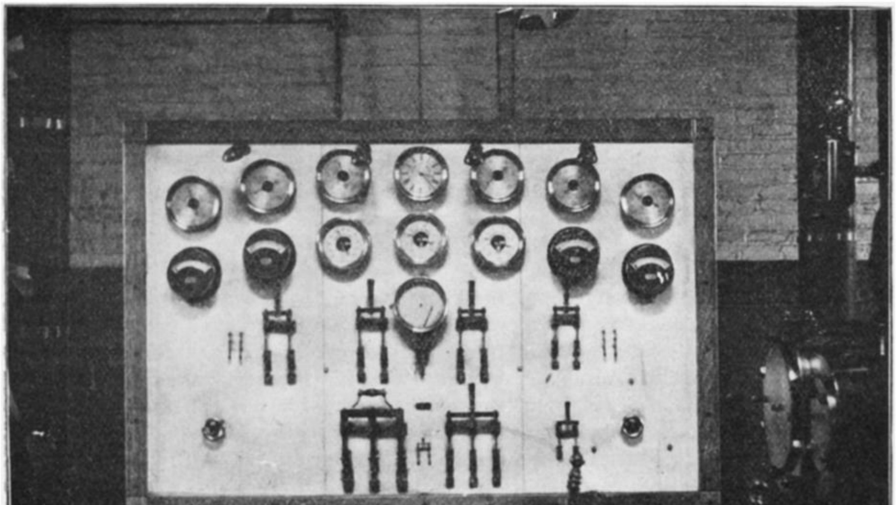


A LOAD OF ARTIFICIAL ICE

II. Plan for work under second group.

1. It is to be understood by students that the observations and records made during the fall and winter quarters upon meteorology and astronomy are to be continued during the present quarter.

2. Compare the periods and intensity of sunshine during the month of April with those observed during the month of March. Note from day to day the variation in time of sunrise and sunset. Measure the declination of the sun at noon on five successive days and compare the variations. Once each week determine the variation (from the east point) of the rising sun. Once each week determine the variation (from the west point) of the setting



POWER-HOUSE SWITCHBOARD

STUDENT'S PAINTING OF LINCOLN PARK IN MARCH

sun. Determine the change in the length of day during the month of April. Determine the factors to be considered in estimating the value of sunshine during the present season of the year.

References: THIRD GROUP. Jackman, *Nature Study for Grammar Grades*, Ch. XXXV, pp. 315-326, Ch. XXXVI, pp. 327-349, Ch. XXXVII, pp. 350-368, Ch. XXXVIII, pp. 369-379, Ch. XXXIX, pp. 380-385; Lange, *Handbook of Nature Study*; Coulter, *Plant Relations*.

III. Plan for work under third group.

1. Visit Lincoln Park, select a portion that gives promise of marked change during the opening season. Note carefully the landscape and its surroundings. Make paintings of the selected portion of the park at least once each week during the spring quarter. Preserve these pictures for reference. Begin the study of the formation of root, stem, and leaf by germinating seeds and bulbs in water-bottles.

2. It is desirable that each student secure a small plot of fertile, unshaded ground—say one square rod—for his exclusive use during April, May, and June. Plant such quantities of the usual vegetable and flower-garden seeds that you may study the development from day to day. Note carefully the meteorological and physical conditions and their effect upon the growth of the plants. Make records of the varying temperature of the atmosphere and soil. (Note: A soil thermometer may be obtained from the laboratory.) Compare the development of a few plants kept in the shade with the growth of those in the open space.

(A further outline of this work will be continued in the May number.)

LINCOLN PARK IN MARCH

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